ACTIVITY 2 - Discovering what happens when substances are mixed

Name:_____ DATE:_____

FOLLOW ALL LAB SAFETY PRECAUTIONS AS RECOMMENDED BY YOUR TEACHER!

Hypothesize: What will happen to the physical properties of the samples when the samples are mixed?

Specifically, what will happen to the temperature of the resulting mixture?

What will the EXACT temperature be of the mixture?

Data Organizer: Mixing two samples of the same substances and equal mass

Substance: _____

Sample	Temperature (ºC)	Mass (kg)
1		
2		

Time and temperature of mixed samples of the same substance:

Time (sec)	Temperature of mixture (ºC)

Conclusions: Summarize your result. What happened when the substances were mixed?

As you repeat this experiment with a different substance, do you see any similarity in results? If yes, what is it? If no, how are the results different?

Suppose that we had 327 grams of liquid nitrogen at -200˚C and 327 grams of liquid nitrogen at -208˚C. What would the final temperature of this mixture be? (Interesting trivia: liquid nitrogen has a melting point of -210˚C and a boiling point of -196˚C which is only a difference of 14˚C!)

Suppose that liquid helium at 2 K were mixed with an equal amount of liquid helium at 4 K. What would the final temperature of the mixture be?

According to Dr. Kevin Boyce of the Suzaku team, the spacecraft itself reaches temperatures of 240 K to 360 K – note that 300 K is approximately room temperature. It is an extreme challenge to drop the temperatures to the 0.06 K needed for the XRS (X-ray spectrometer) to work properly! Read about how this problem is solved here: http://suzaku-epo.gsfc.nasa.gov/docs/suzaku-epo//science/instruments/how_xrs.html and summarize your findings below.

EXTRA CREDIT/EXTENSION: The temperature of space itself is at approximately 3 K (see http://imagine.gsfc.nasa.gov/docs/ask_astro/answers/980301b.html), which is extremely warm compared to the very cold 0.06 K needed for the operation of the XRS on board the Suzaku satellite. Why is space not at absolute zero, and what does this fact have to do with the age of our Universe?